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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/190,207	11/13/1998	JIASHU CHEN	CHEN-4	6396

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EXAMINER	
NGUYEN, DUC MINH	
ART UNIT	PAPER NUMBER
2643	15

DATE MAILED: 07/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	Application No.	Applicant(s)
	09/190,207	CHEN, JIASHU
	Examiner	**Art Unit**
	Duc Nguyen	2643

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-12 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-12 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (5,500,900) in view of Abel (5,659,619).

Consider claim 1. Chen teaches a head-related transfer function model for use (in any event, "for use" is not a positive structural limitation) with 3D sound applications, comprising (a) a plurality of Eigen filters (fig 5a, #42 & 43); (b) a plurality of spatial characteristic functions are adaptively combined with said plurality of Eigen filters (fig 5a, #106 & 107); and (c) a plurality of regularizing models (the spline model, col 5, lines 66 - 67 through col 6, lines 1 -5) adapted to regularize said plurality of spatial characteristic functions (fig 5a, #107 & 108) prior to said respective combination with said plurality of Eigen filters (fig 5a, #51 & 52). The spline method explain that the regularizing is done in the STCF's and FETF's measurements (col 5, lines 18 - 43). Chen also teaches time domain filtering as an alternative (where the basic filters are implemented in the time domain rather than the frequency domain, **the process of convolution is**

<u>**carried out on the input signal and basic filters in impulse response form**</u>; col. 6, ln. 56 to col. 7, ln. 5).

Chen does not clearly teach deriving a plurality of spatial characteristic functions from time domain HRTF.

Abel teaches a time domain HRTF model for use with 3D sound applications, comprising a filters (imaging filter 15, fig. 1 or imaging filter 15', fig. 9); spatial characteristic functions (HRTF table 11, fig. 1 or weight table 31, fig. 9; col. 2, ln. 10-30; col. 9, ln. 20-37) derived from time domain HRTF (col. 4, ln. 41-43; col. 6, ln. 23-25; col. 8, ln. 59-65) and adaptively combined with the filter (imaging filter 15, 15'). Abel also teaches that his invention can be used with any type of filters (col. 4, ln. 52-65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the teachings of Abel into the teachings of Chen in order to provide faster processing time, since implementations and operation on frequency domain transfer functions are often slow (the use of FFT and IFFT).

Consider claim 2. Chen further teaches the head-related transfer function model for use (in any event, "for use" is not a positive structural limitation) with 3D sound applications further comprising a summer (fig 5a, # 80 & 81) operably coupled to the plurality of combined Eigen filters combined with the plurality of regularized spatial characteristic functions to provide the head-related transfer function model (fig 5a, #51 and 52)

Consider claim 3. Chen further teaches the plurality of regularizing models are each adapted to perform a generalized spline model (col 5, lines 66-67 through col 6, lines 1-5). The spline method explain that the regularizing is done in the STCF's and FETF's measurements (col 5, lines 18-43).

Consider claim 4. Chen further teaches a smoothness control operably coupled with the plurality of regularizing models to allow control of a trade-off between localization and smoothness of the head-related transfer function (col 5, lines 27-43).

Consider claim 5. Chen teaches a head-related impulse response model for use (in any event, "for use" is not a positive structural limitation) with 3D sound applications, comprising a plurality of Eigen filters (fig 5a, # 51 & 52); a plurality of spatial characteristic functions are adapted to be respectively combined with the plurality of Eigen filters (fig 5a, #106 & 107); and a plurality of regularizing models adapted to regularize the plurality of spatial characteristic functions (fig 5a, #106 & 107) prior to the respective combination with the plurality of Eigen filters (fig 5a, #51 & 52). (The ref. for this claim is in col 5, lines 29 43). Chen also teaches time domain filtering as an alternative (where the basic filters are implemented in the time domain rather than the frequency domain, **the process of convolution is carried out on the input signal and basic filters in impulse response form**; col. 6, ln. 56 to col. 7, ln. 5).

Chen does not clearly teach deriving a plurality of spatial characteristic functions from time domain HRTF.

Abel teaches a time domain HRTF model for use with 3D sound applications, comprising a filters (imaging filter 15, fig. 1 or imaging filter 15', fig. 9); spatial characteristic functions (HRTF table 11, fig. 1 or weight table 31, fig. 9; col. 2, ln. 10-30; col. 9, ln. 20-37) derived from time domain HRTF (col. 4, ln. 41-43; col. 6, ln. 23-25; col. 8, ln. 59-65) and adaptively combined with the filter (imaging filter 15, 15'). Abel also teaches that his invention can be used with any type of filters (col. 4, ln. 52-65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the teachings of Abel into the teachings of Chen in order to provide faster processing time, since implementations and operation on frequency domain transfer functions are often slow (the use of FFT and IFFT).

Consider claim 6. Chen further teaches the head-related impulse response model for use (in any event, "for use" is not a positive structural limitation) with 3D sound applications further comprising a summer adapted to sum the plurality of combined Eigen filters combined with the plurality of regularized spatial characteristic functions to provide the head-related impulse response model (fig 5a, # 80 & 81).

Consider claim 7. Chen further teaches the plurality of regularizing models are each adapted to perform a generalized spline model (spline model explained at col 5, lines 1-43).

Consider claim 8. Chen further teaches a smoothness control in communication with the plurality of regularizing models to allow control of a trade-off between localization and smoothness of the head-related transfer function (col 5, lines 28-33).

Consider claims 9-12. Chen teaches a method of determining spatial characteristic sets for use (in any event, "for use" is not a positive structural limitation) in a head-related transfer function model, comprising constructing a covariance data matrix of a plurality of measured head-related transfer functions (col 4, lines 40-67); performing an Eigen decomposition of the covariance data matrix to provide a plurality of Eigen vectors (col 4, lines 14 - 40); determining at least one principal Eigen vector from the plurality of Eigen vectors (col 6, lines 14 - 49); and projecting the measured head-related transfer functions back to the at least one principal Eigen vector to create the spatial characteristic sets (col 5 & 6, lines 56 - 67 and 1 - 23). Chen teaches use of frequency domain functions, and frequency domain filtering. Chen also teaches time domain filtering as an alternative (where the basic filters are implemented in the time domain rather than the frequency domain, **the process of convolution is carried out on the input signal and basic filters in impulse response form**; col. 6, ln. 56 to col. 7, ln. 5).

Chen does not clearly teach deriving a plurality of spatial characteristic functions from time domain HRTF.

Abel teaches a time domain HRTF model for use with 3D sound applications, comprising a filters (imaging filter 15, fig. 1 or imaging filter 15', fig. 9); spatial characteristic functions (HRTF table 11, fig. 1 or weight table 31, fig. 9; col. 2, ln. 10-30; col. 9, ln. 20-37) derived from time domain HRTF (col. 4, ln. 41-43; col. 6, ln. 23-25; col. 8, ln. 59-65) and adaptively combined with the filter (imaging filter 15, 15'). Abel also teaches that his invention can be used with any type of filters (col. 4, ln. 52-65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the teachings of Abel into the teachings of Chen in order to provide faster processing time, since implementations and operation on frequency domain transfer functions are often slow (the use of FFT and IFFT).

Response to Arguments

3. Applicant's arguments filed 5/27/03 have been fully considered but they are not persuasive.

Regarding the Abel reference, applicant states "Abel fails to disclose or suggest the HRTFs themselves are in a time domain." In contrast to applicant's assertions, Abel teaches that raw HRTF can be in the time domain or frequency domain form (see fig. 3b-d, HRTFs in time domain form, e.g, amplitude versus time; fig. 5a-b, HRTFs are either in time domain or frequency domain, e.g., amplitude versus time or amplitude versus frequency, respectively).

Applicant further states "Neither Chen nor Able disclose, teach or suggest a plurality of spatial characteristic functions derived from time domain head-related transfer functions in combination with combining the spatial characteristic function with a plurality of Eigen filters." In contrast to applicant's assertion, Able discloses a plurality of spatial characteristic functions derived from time domain head-related transfer functions (see fig. 1 and 9, spatialized output are derived from the raw HRTFs; col. 2, ln. 10-30; col. 9, ln. 20-64). Able further teaches the use of FIR, IIR filters (finite and infinite impulse response filters). Noted that FIR and IIR filter are

realized in time domain (e.g., the term "impulse response" is used for the description in a time domain.)

Applicant further states Able fails to even mention use of either spatial characteristic function (SCFs) derived from head-related impulse responses. In contrast to applicant's assertions, Abel inherently teaches spatial characteristic function (SCFs) derived from head-related impulse responses (see fig. 1 and 9, spatialized output are derived from the raw HRTFs; col. 2, ln. 10-30; col. 9, ln. 20-64).

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Duc Nguyen whose telephone number is (703) 308-7527.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Kuntz, can be reached on (703) 305-4708.

Any response to this final action should be mailed to:
Box AF
Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to:

(703) 872-9315 (Group's Fax numbers)
(703) 746-7251 (Examiner's Fax number, only for proposed amendment)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington. VA., Sixth Floor (Receptionist).

July 15, 2003

DUC NGUYEN
PRIMARY EXAMINER